

Measuring Fish Standard Length

Standard Length: from the tip of the snout to the caudal peduncle (where the fin rays meet the body)

Total length: from the tip of the snout to the tip of the tail. See the last step of the protocol for total length.

What you need:

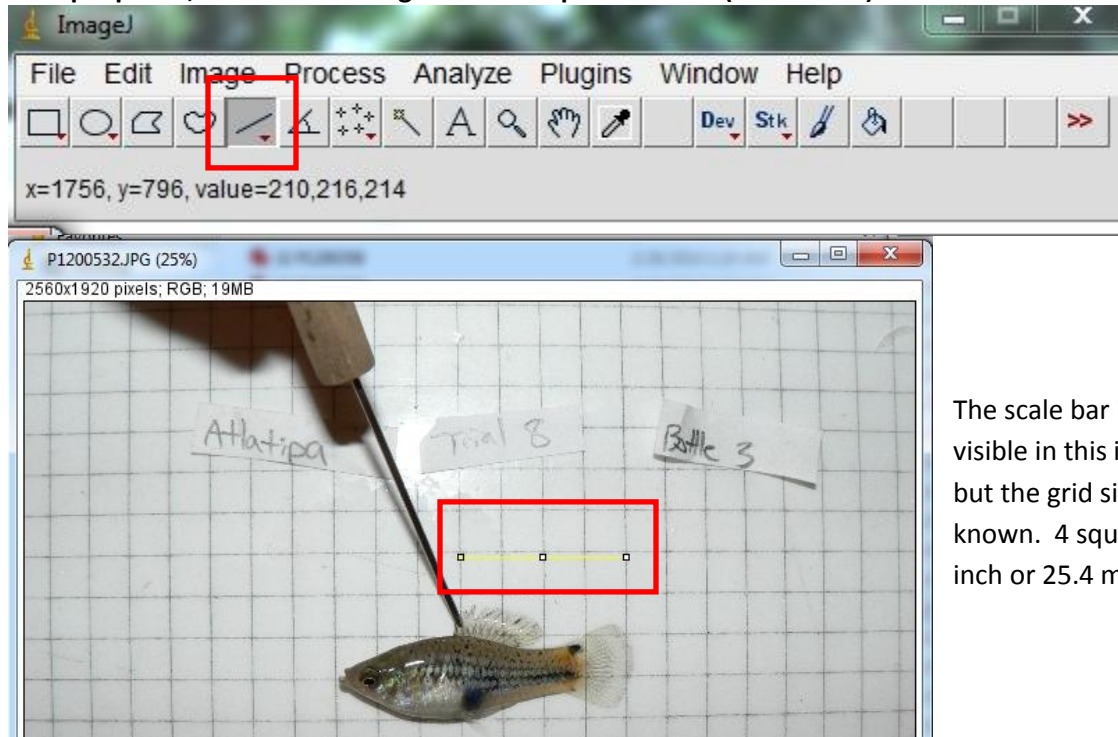
-- Digital images with a scale bar or something of known size in the photo

-- ImageJ software - this can be downloaded for free from <http://www.imagej.nih.gov/ij/>

Notes before beginning: The photos should ideally be taken under as identical of conditions as possible and on a flat surface. The best way to do this is using a copy stand, with the camera mounted at a set distance, with a standard background (ideally gridded or with a waterproof size standard), and the specimen directly under the camera (not at an angle from the lens). If analysis of the coloration of the specimens may be necessary or desired at some point, include a color standard in the photos. Always photograph both the left and right sides of the fish.

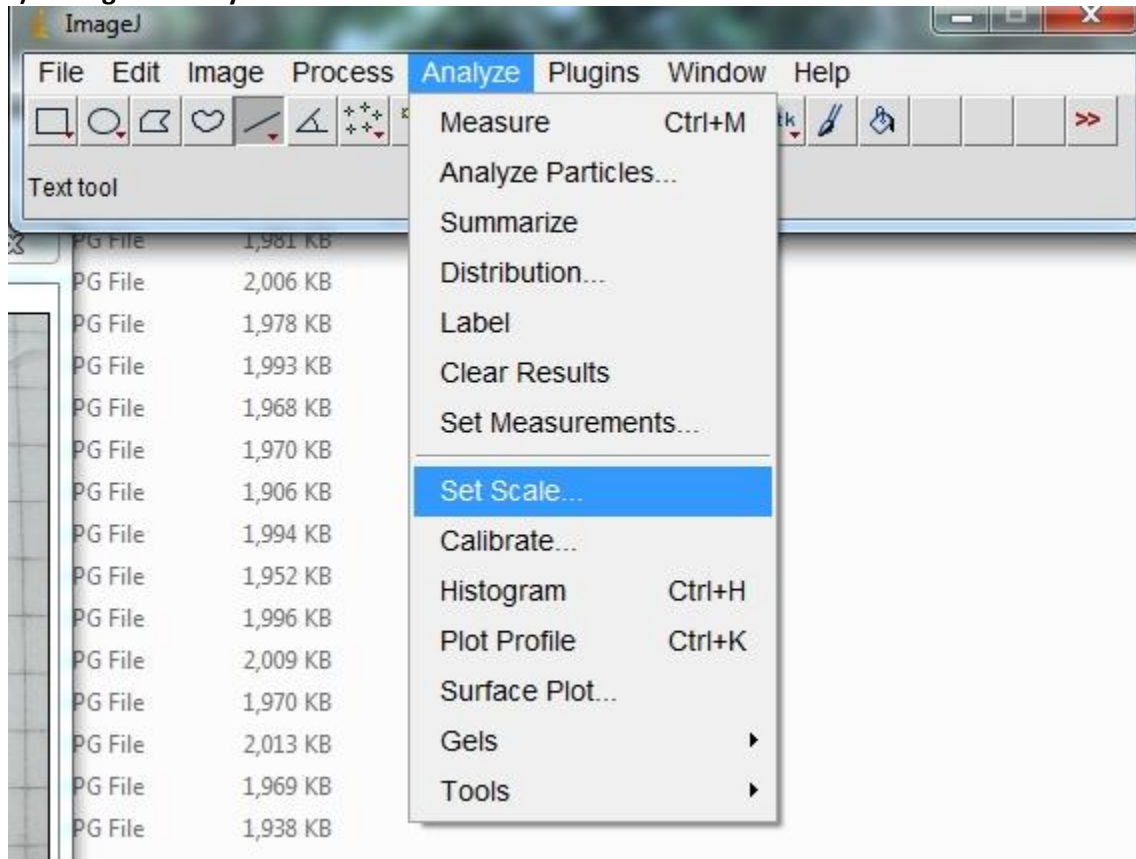
1) Place all the photos you need to measure in a single folder, and open the first photo in ImageJ. Either open ImageJ, browse to the folder and open the first photo or right click the first photo in the folder and select "Open in > ImageJ".

2) Select the straight line tool, and create a straight line in the image of known distance. In the example photo, we know that 4 grid cells is equal to 1 inch (or 25.4mm).

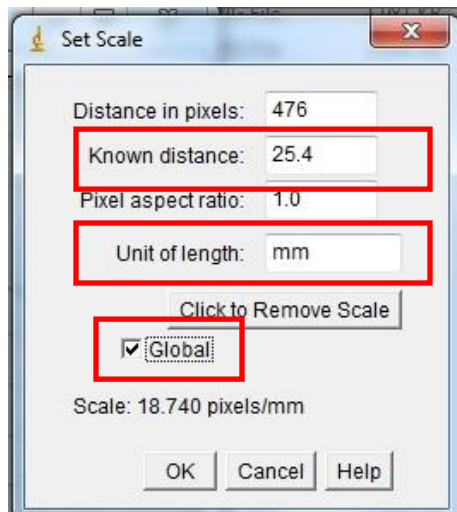


The scale bar is not visible in this image, but the grid size is known. 4 squares = 1 inch or 25.4 mm

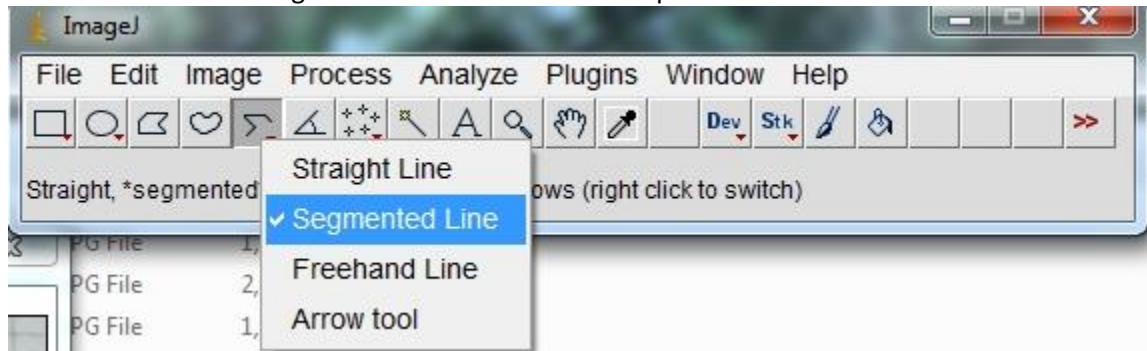
3) Then go to Analysis and select "Set Scale".



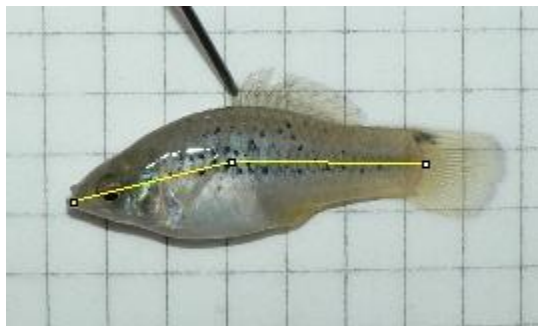
4) Fill in the "Known Distance" box based on your known scale. In this case we use 25.4 mm because this is the scale typically used to report fish sizes (Poeciliids anyway). Type in the units of your scale. **If ALL of the photos you will be measuring were taken at the same time and with the same conditions (i.e., the photos must have the same scale and the camera must be at the same distance the specimens in every photo), then you can check the "global" box. This will apply your scale to all of the photos you measure. If any of the photos were taken with the camera at a different distance, then do NOT select the global box. You will need to set the scale on each new photo or each group that have a standard scale and distance to the camera.**



5) Fish jump and flop when taking pictures and as a result they are not always perfectly straight in the photos. Furthermore, male Poecillids are often thin and lay flat against the background, but gravid females are much more round making it difficult to measure length with a straight line. Select the segmented line from the tools. Then click at the snout of the fish to start. If the fish is straight, you can just double click at the caudal peduncle (Standard Length) or tip of the caudal fin (Total Length). However, if the fish is bent, you can click one or more times along the body to generate a line that better estimates the length of the fish as shown in the photos below.

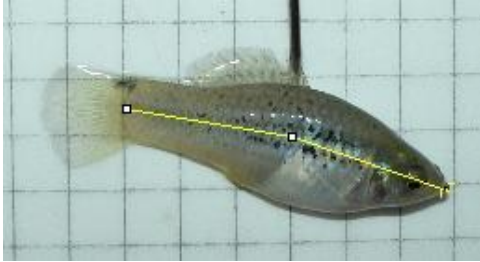


This fish is fairly flat and straight, so a straight line is a good approximation of its length.



This fish is fairly flat but clearly not completely straight, so a straight line would not be terribly accurate for measuring length. Rather, a line that more closely mimics the angle of the fish's body is used.

6) Always measure the length for both sides of the fish. The two lengths will be averaged to get a better estimation of the fish's length.



This fish is the same fish as above, but on the other side. As before the fish is not completely straight, but more so than in the previous photo.

7) Once you have your line on the fish, press control and m on your key board to measure the distance of your line. The first time you do this, a new measurement window will pop up. For subsequent measures when you press control+m, the measurement window will stay in the background, but measurements are still being recorded.

Results					
File	Edit	Font	Results		
	Area	Mean	Min	Max	Length
1	1.916	72.358	7.490	252.218	35.869

8) Check the numbers of the first few measurements to make sure they make sense given what you know about the general size of the fish. If the numbers seem way off, you may have made a mistake when setting the scale.

In order to avoid losing any work, it's best to copy and paste the measurements to an excel file after every 10 or so specimens. NOTE: When you take measurements, ImageJ does not include the filename, it just starts numbering your measurements from 1. You must keep track of which specimens these measurements correspond to. This is an additional reason why it's a good idea to copy and paste the measurements after every 10 or so individuals so you can better keep track of the measurements. If make a mistake you will catch it sooner. If you measure 100 individuals and then realize you made a mistake (measured one fish twice or skipped a fish), it can be hard to figure out which measurements go with which specimens and you may have to start over. NOTE 2: After you copy and paste measurements to a spreadsheet, back in the measurements window in ImageJ, go to Edit>Clear, to remove the measurements you've already recorded in your spreadsheet. This will prevent you from accidentally recording some measurements twice, which again can cause confusion.

9) Once the values have been copy-pasted to Excel, you can use =AVERAGE tool to average the measurements from the left and right sides of the body to get the final standard length measurement for each specimen.

TOTAL LENGTH

The procedure for measuring total length is the same as for standard length, but the line should extend to the edge of the caudal fin.

